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**We claim**

- 1) A novel process for the commercial production of polyunsaturated fatty acid and micronutrients rich zero-trans shortening by chemical interesterification to produce nutritionally and functionally superior shortening without hydrogenation. The process involves blending of palm oil and palm stearin with rice bran oil, interesterification in presence of sodium methoxide catalyst, inactivation of the catalyst, washing with hot water, deodorization of the resultant product, and finally passing the interesterified product through margarine crystallizer under controlled conditions followed by packing and tempering.
- 2) A process as claimed in claim 1 wherein the required homogeneity is attained by heating the palm stearin or palm oil to 60-80°C, then adding rice bran oil in the proper proportion to the melted palm stearin or palm oil, and charging the blend to the reactor vessel and heating to a temperature of 60-110°C under vacuum (60-80mmHg) with stirring.
- 3) A process as claimed in claims 1-2 wherein 0.2-0.9% sodium methoxide catalyst is added with vigorous stirring for 5-60 mins under the above conditions of temperature and vacuum.
- 4) A process as claimed in claims 1-3 wherein sodium methoxide catalyst is inactivated by adding calculated amount of citric acid (0.2-1.2%) and aqueous layer is separated and again washed with hot water at 60-90°C till neutral.

- 5) A process as claimed in claims 1-4 wherein the resultant interesterified product is deodorized at a temperature of 140-180°C and under a vacuum of 1-5 mbar for 1-4h.
- 6) A process as claimed in claims 1-5 wherein the resultant deodorized interesterified product at 50-80°C is fed into the margarine crystallizer with a feed rate of 8-15 kg/hr.
- 7) A process as claimed in claims 1-6 wherein the refrigerant temperature of the margarine crystallizer is adjusted to 5-25°C.
- 8) A process as claimed in claims 1-7 wherein the interesterified fat fed into the margarine crystallizer is cooled to a temperature of 20-35°C.
- 9) A process as claimed in claims 1-8 wherein the backpressure in the scraped surface heat exchanger (muator) is adjusted to 5-10 bar.
- 10) A process as claimed in claims 1-9 wherein the interesterified fat is crystallized in the mutator at a mutator speed of 150-250 rpm.
- 11) A process as claimed in claims 1-10 wherein the product coming out of the mutator is subjected to beating in the pinworker at a speed of 50-150 rpm.
- 12) A process as claimed in claims 1-11 wherein the product collected from the margarine crystallizer under specified temperature of 20-35°C and tubbed.
- 13) A process as claimed in claims 1-12 wherein the filled product is tempered at 25-35°C for 3-10 days to get a plastic shortening with a requisite granular structure, which fall within the limits of specification requirements.
- 14) A process as claimed in claims 1-13 wherein tocots enriched (900-1000ppm) zero-trans shortening is obtained.

- 15) A process as claimed in claims 1-14 wherein phytosterols enriched (0.5-1%) zero-trans shortening is obtained.
- 16) A process as claimed in claims 1-15 wherein oryzanol enriched (0.5-0.8%) zero-trans shortening is obtained.
- 17) A process as claimed in claims 1-16 wherein the interesterified zero-trans shortening fall under the category of all-purpose shortenings with good plasticity and maximum  $\beta'$  polymorphic form (72%).
- 18) A process as claimed in claims 1-17 wherein the interesterified zero-trans all-purpose shortening has good oxidative stability.
- 19) A process as claimed in claims 1-18 wherein the polyunsaturated fatty acid and micronutrients rich zero-trans all-purpose shortening meets the specification requirements such as slip melting point, FFA, moisture, unsaponifiable matter and iodine value prescribed for shortening.
- 20) A novel process for the production of zero-trans polyunsaturated fatty acid and micronutrients rich all-purpose shortenings with characteristics as in Table 1, 2, 3 and 4 by interesterification substantially as herein described with reference to the example cited.

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